

Mass vs. Weight

Name _____ Date _____

Chair Role _____ Section _____

Background Information:

Mass is a measure of the amount of matter in an object. **Weight** is a measure of the gravitational force pulling on an object. *Mass is always constant* for an object and does not change, no matter where the object is in the Universe. *Weight may change* because it is determined by the amount of gravity being exerted on an object. One of the factors that affect gravity is mass.

For example, the Earth has a greater mass than the Moon and therefore exerts a stronger gravitational pull. That is why the weight of an object on the moon is less than its weight on Earth. Since the Earth has six times the mass of the Moon an object's weight on the Moon will be 1/6 of its weight on Earth.

To find the weight of an object on different planets, we use the formula $\text{weight} = \text{mass} \times \text{surface gravity}$. The following table lists the surface gravity for select planets.

Planet	Surface Gravity (m/s ²)
Mercury	3.7
Earth	9.8
Moon	1.62
Saturn	10.44
Jupiter	24.92
Mars	3.71
Venus	8.87

Materials:

Triple Beam Balance
Spring Scale
Glass Bottles
Wood Block

Book
Volumetric Cube
Weight

Part 1:

Procedures:

1. Using the balance, measure the mass of each item listed below.
2. Record your data.
3. Using the *spring scale*, measure the weight of each item listed below.
4. Record your data.
5. Complete the rest of Table 1.

Data:

Table #1

<i>Item</i>	<i>Mass on Earth (g)</i>	<i>Weight on Earth (N)</i>	<i>Mass on the Moon (g)</i>	<i>Weight on the Moon (N)</i>
Book				
Glass bottle				
Wood block				
Volumetric Cube				
Weight				

Analysis: On a separate sheet of graph paper construct a graph with mass in grams (g) on the x-axis and weight in Newtons (N) on the y-axis.

1. Title your graph "Mass vs. Weight"
2. Label the x-axis Mass (in grams (g))
3. Label the Y-axis Weight (in Newtons (N))
4. Plot the points for the Earth data on the graph.
5. Draw a trend line for the Earth points plotted and label the line "Earth"
6. Using a different color plot the points for the moon data on your graph.
7. Again using a new color draw a trend line for the moon points plotted and label the line "Moon."

Part 2

Mass vs. Weight Activity Questions:

Answer the following questions on this paper.

1. What would the weight of a 352g object be on the moon?
2. If an object had a mass of 216g on Earth what would its mass be on the moon?
3. If an object weighed 0.50 N on the moon what would its mass be on Earth? (Hint: this is a two step problem – think about it!)
4. The mass of a moon rock was not measured before it was brought back to Earth. How would you be able to determine what its mass would be on the moon? Explain your answer.
5. Why does the weight of an object change when you go the moon? Explain.
6. What instrument did we use to measure mass? Weight?
7. On Earth, how many grams of mass does it take to produce a force of 1 Newton?
8. Which would change, your mass or your weight if you climbed to the top of a tall mountain? Explain why. (*Hint: Gravity is affected by the distance between objects.*)

Part 3

My Weight on Different Planets or Moons

1. My weight on different planets and moons is not the same as on the Earth

because: _____
_____.

2. MY WEIGHT IN SPACE- write your weight on each planet.

Earth _____

Earth's Moon _____

Mercury _____

Venus _____

Mars _____

Saturn _____

Jupiter _____